DESIGNATION of the

PETAPAWAG AREA OF CRITICAL ENVIRONMENTAL CONCERN

located in portions of the Municipalities of
AYER, DUNSTABLE, GROTON, PEPPERELL, and TYNGSBOROUGH

WITH SUPPORTING FINDINGS

Following an extensive formal review required by the regulations of the Executive Office of Environmental Affairs relative to Areas of Critical Environmental Concern (301 C.M.R. 12.00) including nomination, on-site visits, research, public information meetings, a public hearing and written comment period, and evaluation of all public comment and assembled data, I, the Secretary of Environmental Affairs, hereby designate the Petapawag resource area, located in portions of the municipalities of Ayer, Dunstable, Groton, Pepperell and Tyngsborough, as an Area of Critical Environmental Concern (ACEC). I take this action pursuant to the authority granted me under Mass. Gen. L. ch. 21A, § 2(7).

I also hereby find that the wetland resource areas included in the Petapawag ACEC are significant to the protection of groundwater supply and private water supplies, the prevention of pollution, flood control, the prevention of storm damage, the protection of fisheries, and the protection of wildlife habitat - all of which are public interests defined in the Wetlands Protection Act and regulations promulgated thereunder.

I. Procedures Leading to ACEC Designation

On March 25, 2002 I received a letter of nomination submitted by 66 citizens from the 5 municipalities located within the nominated area pursuant to the ACEC Regulations at 301 C.M.R. 12.05. On the same date, I also received a letter of nomination for the Squannassit resource area, located adjacent to the nominated Petapawag resource area in the municipalities of Ashby, Ayer, Groton, Harvard, Lancaster, Lunenburg, Pepperell, Shirley and Townsend, submitted by 125 citizens area pursuant to the ACEC Regulations at 301 C.M.R. 12.05. On April 11, 2002 I accepted the Petapawag and Squannassit nominations for separate and concurrent full reviews. Because the nominated areas are located adjacent to one another with clear ecological relationships, and portions of three communities (Ayer, Groton and Pepperell) are located in both nominated areas, public information meetings that covered both nominated areas were held in the course of the public reviews. Throughout the reviews public comments were submitted addressing either or both of the nominated areas. Toward the end of the public review process, separate public hearings were held for each nomination, and separate designation decisions are provided. See the designation document for the Squannassit Area of Critical Environmental Concern for further information regarding that nomination review and designation.

In my April 11, 2002 letters to the nominators, municipalities, state legislators and a mailing list of over 300 names, I outlined the ACEC nomination review process, and scheduled initial public information meetings to be held in May and June in each of the 11 communities included in the two nominated areas. Notice of these public information meetings was also included in the April 24, 2002 issue of *The Environmental Monitor*, published by the Massachusetts Executive Office of Environmental Affairs (EOEA), and in several local and area newspapers.

For the first time in the history of the ACEC Program, the nominators created an internet web site

for the dissemination of information regarding the nomination and the public review process. Also for the first time, the nominators used Geographic Information System (GIS) computer mapping and databases to prepare the nomination and to provide resource overlay maps for both the nomination reports and the internet web site. The ACEC Program internet web site also provided information regarding the nomination public review process and details regarding the ACEC Program.

Eleven public information meetings were held in May and June as scheduled. Following these meetings, in correspondence to the nominators, towns and legislators dated August 8, 2002 I confirmed the scheduling of four additional public information meetings, to be held in August and September in the towns of Ayer, Tyngsboro, Pepperell and Dunstable. At this time I also scheduled the public hearings to be held for each nomination, for Squannassit on September 24 in Townsend and for Petapawag on October 1 in Groton. Over 400 copies of the letter and public notice were mailed to municipal boards of selectmen, planning boards and conservation commissions, and to state legislators, state and regional agencies, environmental organizations, citizens, and other interested parties.

As required by the ACEC Regulations at 301 C.M.R. 12.08, a copy of the public notice was published in the August 10 and August 24, 2002 issues of *The Environmental Monitor*, published by EOEA. Copies of the public notice were also published in the following newspapers - the *Sentinel and Enterprise*, on August 13 and 19; the *Groton Landmark*, the *Harvard Hillside*, the *Pepperell Free Press*, the *Ayer Public Spirit*, the *Shirley Oracle*, and the *Townsend Times* on August 16; the *Lowell Sun*, on August 19; the *Shirley Volunteer* and the *Worcester Telegram and Gazette*, on August 20; and the *Groton Herald*, on August 23, 2002. The August and September public information meetings were held as scheduled.

I conducted a public hearing regarding the Petapawag nomination on October 1, 2002, at the Groton-Dunstable Middle School Auditorium in Groton. Oral and written testimony was received from approximately 70 people representing individual residents and a variety of groups and organizations. Approximately 150 people attended the hearing. A ten-day period for the submission of additional written comment (ending October 11) followed the public hearing.

On November 25, 2002 I issued a formal waiver, pursuant to the ACEC Regulations at 301 CMR 12.15, to waive the 60-day time period following a public hearing for making a final decision regarding ACEC designation (as set forth at 301 CMR 12.10). Due to the extensive scope and complexity of the environmental review, the final date for making this decision was changed from December 2, 2002 to December 16, 2002.

In the course of the overall review for both nominations written and oral testimony was received from numerous individuals, private organizations and public agencies. Copies of comment letters are on file at the offices of the Department of Environmental Management (DEM), Division of Resource Conservation, ACEC Program in Boston. Approximately 250 oral and written comments, plus a petition with 42 signatures, were received for the two nominations in the course of the public participation and review process. For further details see below, Summary of Comments under IV. Summary of the Criteria for Designation.

II. Summary Description of the Resources of the Petapawag ACEC

Resource Analysis and Mapping

In the course of administering the review of the nomination, DEM prepared a series of environmental

resource overlay maps regarding the nominated area. This information was mapped using EOEA's Geographic Information System (MassGIS). The maps, which were used to assist in the evaluation of the nomination and the determination of final boundaries, are part of the public record of the Petapawag ACEC

designation, and are on file at the offices of the ACEC Program at DEM's Division of Resource Conservation.

MassGIS data was used to map and evaluate several categories of information: surface waters and drainage basins; wetlands; public drinking water supplies and aquifers; floodplains; rare and endangered species habitat; land use; Chapter 61 (forestry), 61A (agriculture), and 61B (recreation) properties; and protected open space, conservation and recreation lands owned by federal, state, and municipal governments and nonprofit organizations.

Resource Overview

A brief summary of the resources of the ACEC is provided in this designation document. Additional useful information regarding these resources is provided in the Petapawag ACEC Nomination Report (March 2002) and other materials and correspondence assembled as part of the nomination review.

The size of the designated Petapawag ACEC is approximately 25,630 acres, with approximate amounts in each town as follows:

Ayer	1,960	acres
Dunstable	6,610	acres
Groton	14,950	acres
Pepperell	2,040	acres
Tyngsborough	70	acres

The Petapawag ACEC is located along and to the east of the Nashua River, from the Town of Ayer north to New Hampshire. It is adjacent to the Squannassit ACEC, which is located along and to the west of the Nashua River from Route 2 in Harvard and Lancaster north to New Hampshire (the boundary of the Squannassit ACEC connects to the boundary of the Central Nashua River Valley ACEC to the south, along the Nashua River corridor). The Petapawag and Squannassit ACECs share the Nashua River corridor and its associated physical, biological and cultural resources and history. Although the two areas were nominated and designated as separate ACECs, it is important to state that the Nashua River corridor is a central resource feature of both of these ACECs.

According to the nominators, the name of the area, Petapawag, is derived from the name of the area prior to colonial settlement, when the Nashaway, a band of a broader group of Algonquin speaking peoples, inhabited the land. Petapawag means "swampy place/land." These wet places are a distinctive aspect of large portions of the ACEC, as described below.

The resources of the Petapawag ACEC are located in portions of two major watersheds, the Nashua and the Merrimack river basins. The drainage divide between these two major river basins runs in a north-south direction, with approximately 15,680 acres or 61 % of the ACEC located in the Nashua basin to the west, and approximately 9,950 acres or 39% located in the Merrimack basin to the east. All of the area within the Petapawag ACEC in Pepperell, almost all of the areas in Ayer, and most of the area in Groton are located within the Nashua watershed. All of the area in Tyngsborough and most of the area

in Dunstable is located in the Merrimack watershed. For more details about subwatersheds within the ACEC see Surface Waters below.

An overview of the geology, topography, hydrology and vegetation of the area is provided in the Petapawag ACEC Nomination Report. In this overview, the report highlights important aspects of the glacial and natural history of the area, as follows:

> The Squannassit/Petapawag area contains one of the most remarkable concentrations and varieties of glacial landforms in New England: a multiple-form drumlin swarm; extensive areas of eskers, kames and kettles; broad glacial moraines; areas scraped bare by the glacier; and the remnants of an enormous glacial lake with both hanging deltas where streams flowed in and valleys where great - though short-lived rivers - flowed out. The drumlin swarm is one of the most sculptural topographic forms that can be found anywhere.
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> This set of landforms has left complex patterns of both topography and soils. The small scale and variability of the glacial landforms results in rapid changes in degree and orientation of slope across the landscape. The types of soils in the various landforms also vary rapidly from place to place …. The array of glacial landforms … also caused unusually complex hydrologic systems ….
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> Furthermore, the Squannassit/Petapawag nomination areas contain unusually complex vegetative systems, due not only to variability of soils and hydrology, but also to regional geography. The area lies at the transition between two major forest biomes, the northern hardwood-hemlock-white pine forests which extend into Canada, and the central hardwood-oak-hickory forests which extend to Georgia …. The confluence of diversity of topography, soils, hydrology, and vegetation is unique and has, in turn, resulted in a corresponding diversity of habitat types and therefore of biodiversity.

Extensive water resources range from streams, ponds, wetlands and floodplains to meduim and high yield aquifers. The ACEC supports a rich diversity of wildlife. Rare species habitats are located throughout the ACEC, as well as extensive areas designated as Core Habitat and Supporting Natural Landscape by the Commonwealth's BioMap Project (see below for BioMap Project description). Agriculture and forestry are important components of the overall resource complex. The area contains unique and highly significant archaeological and historical resources, as well as scenic landscapes of statewide significance.

According to maps and data prepared for the review of the nomination by DEM, approximately 66% of the ACEC is comprised of forest and farmland. (Approximately 14,160 acres or 55% of the ACEC is comprised of forest land and approximately 2,670 acres or 10% is farmland.) Nearly 30% of the ACEC is comprised of protected open space and land under Chapter 61, 61A and 61B tax classification status. (Protected open space covers approximately 4,340 acres or 17% of the ACEC, and Chapter 61, 61A and 61B lands cover another 3,130 acres or 12% of the ACEC.)

The ACEC includes all nine groups of the inland resource features listed in the ACEC Regulations, of which a minimum of four are required for nomination review. Those resource features are inland surface waters, inland wetlands, natural hazard areas, habitat resources, fishery habitat, agricultural areas, water supply areas, historic/archaeological resources, and special use areas.

Surface Waters

The ACEC includes portions of both the Nashua and Merrimack River watersheds. The drainage divide between these two major river basins runs in a north-south direction, with approximately 15,680 acres or 61% of the ACEC located in the Nashua basin to the west, and approximately 9,950 acres or 39% located in the Merrimack basin to the east. Sub-watersheds within the ACEC that are part of the Nashua River basin (starting from the south) include: a) the Long Pond/Sandy Pond/Flannagan Pond drainage subbasin in Groton and Ayer, which flows into Grove Pond and Nonacoicus Brook and thence to the

Nashua River (Grove Pond and Nonacoicus Brook are located within the adjacent Squannassit ACEC); b) the James Brook sub-watershed in Groton and Ayer; c) a sub-watershed of relatively short, unnamed and named (Nod Brook, Reedy Meadow Brook) streams, draining into the Nashua River in Groton and Pepperell; and d) the Unkety Brook watershed in Groton, Pepperell and Dunstable. There is one sub-watershed within the ACEC that is within the Merrimack River basin, which drains south to north, along the Knops Pond/Lost Lake/Whitney Pond/Cow Pond Brook/Massapoag Pond/Salmon Brook corridor.

According to the Petapawag ACEC Nomination Report, the length of streams in the area are small, with a complex array of glacial landforms which frequently tend to block natural drainageways, resulting in circuitous stream courses. The report states that, "Petapawag is therefore characterized by a system of intermittant streams and short perennial streams…. (it) contains all or portions of the Nashua River and 29 perennial streams." The 29 streams are listed in Table 1 of the report and in the Petapawag ACEC Summary Sheet. In addition to the streams described above, larger streams within the ACEC (all within the Merrimack River watershed) include Martins Pond Brook, Baddacook, Hauk and Joint Grass Brooks. According to the nomination, approximately 2,900 acres, or about 11% of the nominated area lies within 200 feet of a river or perennial stream.

In describing ponds and lakes within the Petapawag area, the nomination report states that there are approximately 15 ponds greater than 5 acres located within the nominated area, with many small ponds distributed throughout the area as open areas of water within wetlands or as beaver ponds. The largest lakes and ponds within the Nashua River basin and the ACEC include Flannagan Pond (104 acres) and Sandy Pond (69 acres) in Ayer; Long Pond (46 acres) in Ayer and Groton; and Pepperell Pond (305 acres) in Groton and Dunstable. The largest lakes and ponds within the Merrimack River basin and the ACEC include Knops Pond/Lost Lake (186 acres) in Groton; Whitney or Cow Pond (34 acres) in Groton; Massapoag Pond (111 acres) in Dunstable, Groton and Tyngsborough; Lower Massapoag Pond (31 acres) in Dunstable; Martins Pond (19 acres) and Baddacook Pond (74 acres) in Groton; and an unnamed pond (32 acres) north of Hound Meadow Hill and Fletcher Street in Dunstable.

According to the list of Great Ponds compiled by the Department of Environmental Protection in 1996, the following lakes or ponds are classified as Great Ponds, subject to the provisions of the Waterways (Chapter 91) Regulations (301 CMR 9.00):

Sandy or Sand Pond in Ayer
Long Pond in Ayer and Groton
Massapoag Pond in Dunstable, Groton and Tyngsborough
Knops Pond/Lost Lake in Groton
Whitney or Cow Pond in Groton
Martins Pond in Groton
Baddacook Pond in Groton

Wetlands

According to GIS data, wetlands cover approximately 1,560 acres or 6% of the ACEC (this figure most likely underestimates the amount of wetlands within the ACEC – it will be updated in the Petapawag ACEC Summary Sheet when the more accurate MassGIS Orthophoto Wetlands and Streams (1:5,000) datalayers are available for the entire ACEC). Wetlands are located along many of the stream corridors, as well as in many low lying areas scattered throughout the ACEC. Hence, the name of the ACEC – Petapawag – "swampy area." Larger wetlands identified on the USGS topographical map include Burnt Meadow Swamp, Reedy Meadow, and Hauk Swamp. These wetlands are an important feature of this

ACEC, creating the conditions for the extraordinary rare species habitats described below. As a finding of this ACEC designation, the wetland resource areas included in the Petapawag ACEC are significant to the protection of groundwater supply and private water supplies, the prevention of pollution, flood control, the prevention of storm damage, the protection of fisheries, and the protection of wildlife habitat - all of which are public interests defined in the Wetlands Protection Act and regulations promulgated thereunder.

Natural Hazard Areas

Natural hazard areas, as a resource category in the ACEC regulations, include floodplain areas. Floodplains designated by the Federal Emergency Management Agency (FEMA) are shown on the GIS maps prepared for the nomination report and also by DEM GIS staff for the ACEC nomination review. According to DEM GIS data, 100 and 500-year floodplains cover approximately 4,680 acres, or 18% of the ACEC. Floodplains are located along the Nashua River along the western edge of the ACEC, and along several streams, including the Knops Pond-Salmon Brook Corridor along the eastern edge of the ACEC, and the Unkety Brook, Hauk Brook and Joint Grass Brook corridors.

Habitat Resources

Wildlife resources and habitats of the Petapawag ACEC are diverse and extensive. General wildlife and rare species habitat include fisheries and wildlife habitat, rare species habitats described as Priority Habitats and Estimated Habitats for Rare Wildlife by the Commonwealth's Natural Heritage & Endangered Species Program (NHESP), Core Habitat and Supporting Natural Landscape areas identified by the NHESP's BioMap Project, Rare Reptile and Amphibian Reserves identified by the NHESP, and Potential and Certified Vernal Pools. Many of these resource categories or features overlap within the Petapawag area. These resources are described in further detail below and in section IV. Summary of the Criteria for Designation.

- General Wildlife Habitat

The Petapawag Nomination Report includes a summary and excerpts of a report, Focus Areas for Wildlife Habitat Protection in the Nashua River Watershed, September 2000, prepared by Jeffrey Collins of the Ecological Extension Services of the Massachusetts Audubon Society. According to the nomination report, this habitat protection study provides substantial base information about the nominated area, and describes five specific areas, larger blocks of unfragmented land important for wildlife habitat, located within or partially within the nominated area. A map of these areas is shown in the nomination report, Figure 12, Wildlife Habitat Focus Areas. According to the Wildlife Habitat Protection report, "biodiversity at multiple levels will best be maintained in a system of large, undisturbed core areas, surrounded by buffer zones of limited disturbance, and connected by functional corridors for wildlife dispersal." The five focus areas located within or within portions of the Petapawag ACEC are Horse Hill/Baddacook Pond (3,800 acres), Hound Meadow Hill/Hauk Swamp (3,100 acres), Snake Hill/Long Pond (2,500 acres), Squannacook Hill/Groton Town Forest (2,800 acres) and J. Harry Rich State Forest/Shephard Hill (1,500 acres). Approximately 11,290 acres or 44% of the ACEC is located within these habitat focus areas. The study is an important reference for ongoing and future stewardship activities within the ACEC and in adjacent areas.

According to the nomination report, the Nashua River is designated as part of the North American

Waterfowl Management Plan, and provides breeding and migration habitat for migratory waterfowl. The presence of species such as black bear, bobcat, moose, otter and fisher are indicative of the high quality of the habitat. The excellent cold water and warm water fisheries in this region are further described in the Fishery Habitat section below.

- Rare Species

According to comments provided by the NHESP, documented records from the Natural Heritage database indicate that there are 16 state-listed rare species known to occur within the boundaries of the Petapawag ACEC. This number includes seven Endangered Species, one Threatened, and eight listed as species of Special Concern. One of the Endangered species is also federally-listed as Threatened. There are 18 Priority Habitats and Estimated Habitats for Rare Wildlife mapped by the NHESP that cover approximately 2,560 acres or 10% of the ACEC. Priority Habitats represent areas of known state-protected rare plant and animal species occurrences in Massachusetts. Estimated Habitats depict estimated habitats of state-protected rare wildlife occurring in wetlands areas, designed for use with the Wetlands Protection Act Regulations (310 CMR 10.00). Additional significance of these state-listed species is described in section IV. Summary of the Criteria for Designation.

- Core Habitat and Supporting Natural Landscape

The BioMap project of NHESP, published in 2001, delineated as Core Habitat those areas of the state which, if protected, would protect the most viable populations of rare plants and animals, the best examples of natural communities, and the breadth of biodiversity of the state. Twenty-three percent of the entire state was delineated as Core Habitat. In the Southern New England Coastal Plains and Hills ecoregion, which includes the Petapawag ACEC, only 15% of the ecoregion is Core Habitat. Approximately 13,910 acres or 54% of the Petapawag ACEC is BioMap Core Habitat. The significant extent of Core Habitat within the ACEC is further described in section IV. Summary of the Criteria for Designation. In addition, approxximately 3,720 acres or 15% of the ACEC is designated as Supporting Natural Landscape, which are large, generally unfragmented areas that safeguard the Core Habitat while also including habitat for the common species of Massachusetts. Combined Core Habitat and Supporting Natural Landscape cover approximately 69% of the ACEC. The BioMap report is an important reference for ongoing and future stewardship activities within the ACEC and in adjacent areas.

- Rare Reptile and Amphibian Reserves

According to comments provided by the NHESP,

> From 1998 through 2000, the NHESP surveyed sites across the state for state-listed rare reptiles and amphibians, eventually choosing nine areas as potential "herp reserves" because of the presence of multiple rare herptile species, relative lack of habitat fragmentation, and diversity of wetland types interspersed with undeveloped uplands. The reserve areas were delineated around known rare species sites based on dispersal distances and habitat use for each rare herptile species represented at a site, so that the population of each species could have a high likelihood of long-term persistence.
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> The proposed 18,000-acre Unkety Brook Herp Reserve includes the northern half of the proposed Petapawag ACEC, plus areas east and west of the proposed ACEC boundaries. This herp reserve was delineated to protect populations of Blanding's Turtles (*Emydoidea blandingii*, Threatened), Spotted Turtles (*Clemmys guttata*, Special Concern), and Blue-spotted Salamanders (*Ambystoma laterale*, Special Concern). Only three of the nine herp reserves are known to harbor more than two of the targeted rare reptiles and amphibians; the proposed Unkety Brook Herp Reserve is one of those three. This herp

> reserve is the largest (in acreage) of the herp reserves delineated across the state. As the Natural Heritage report on the project states, "…the Unkety site may be key to the persistence of Blanding's turtles in Massachusetts and may be essential to maintaining connectivity with populations of target species in New Hampshire and Maine."

In addition to the Unkety Brook Habitat Reserve, an important portion of the Squannacook Herp Reserve is also located within the Petapawag ACEC. The 6,700-acre Squannacook Reserve is located largely west of the Nashua River (mostly within the Squannassit ACEC), but extends to the east side of the Nashua River in Groton, within the Petapawag ACEC. Portions of these two Reserves cover approximately 13,900 acres or 54% of the ACEC.

The significance of this Rare Reptile and Amphibian Reserve within the ACEC is further described in section IV. Summary of the Criteria for Designation.

- Vernal Pools

According to comments provided by the NHESP,

> Vernal pools are temporary, fishless depressions which typically hold water for several weeks to several months out of a year. Because of the lack of fish predators, several species of reptiles and amphibians breed exclusively, or often, in vernal pools. Other reptiles and amphibians use vernal pools for feeding or rehydration during their travels over the course of a year. The relative scarcity of vernal pools, and their susceptibility to destruction by development or pollution, probably contributes to the rarity of the following state-listed rare vertebrates which use vernal pools in Massachusetts: Marbled Salamander (Threatened), Spadefoot Toad (Threatened), Blue-spotted Salamander (Special Concern), Jefferson Salamander (Special Concern), all of which breed only in vernal pools; and Blanding's Turtle (Threatened), Four-toed Salamander (Special Concern), Spotted Turtle (Special Concern), and Wood Turtle (Special Concern), which use vernal pools for feeding or (Four-toed Salamanders, sometimes) breeding.
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> The proposed Petapawag ACEC includes reported sites for five of these eight rare species. The high density of vernal pools within the boundaries of the proposed ACEC is very likely a major factor in the presence of these five species.

There are 15 NHESP Certified Vernal Pools within the ACEC. Also within the ACEC are 332 Potential Vernal Pools as identified through photointerepretation by the NHESP in the 2001 Massachusetts Aerial Survey of Potential Vernal Pools. The significance of vernal pools within the ACEC is further described in section IV. Summary of the Criteria for Designation.

Fishery Habitat

Trout are stocked in Salmon, Unkety and Cow Pond Brooks, and Massapoag, Baddacook and Knops Ponds. Wild brook trout occur in Unkety Brook. The nomination report also documents that the state Division of Fisheries and Wildlife (MassWildlife) finds that excellent fishing for largemouth bass occurs in Baddacook and Knops Ponds and in the Nashua River. The lakes, ponds, rivers and streams provide habitat for cold water fish such as brown, brook and rainbow trout, as well as warm water fish including large-mouth bass, chain pickerel, brown trout, fallfish, carp, brown bullhead, yellow perch, bluegill, and bridle shiner.

Agricultural Areas - Farmland and Forestland

Farming and forest management are an integral part of overall resource preservation and management within an ACEC. According to GIS land use data prepared for the review of the nomination, there are approximately 14,160 acres of forestland and 2,665 acres of farmland within the ACEC, which cover 55% and 10% of the ACEC, respectively.

- Forestland

Forestland and forest management activities are an important part of the Petapawag landscape and resource area. Recognizing the importance of preserving as much of this forestland as possible, the entire Nashua River Watershed has been included as a Forest Legacy Area under the Forest Legacy Program administered by the United Sates Forest Service in partnership with DEM's Bureau of Forestry. The purpose of the

Program is to conserve private, working forestlands principally through the acquisition of conservation restrictions. Approximately 61% of the Petapawag ACEC is included within this Forest Legacy Area.

As a subset of the total amount of forested land within the ACEC, according to MassGIS open space data the amount of land under the Chapter 61 forestland tax classification is approximately 1,060 acres or 4% of the ACEC.

A recent study by the Harvard Forest provides additional information regarding the amount of forest cutting undertaken under the Forest Cutting Practices Act (through forest cutting plans approved by the DEM Bureau of Forestry). According to this landscape-scale research project, during the period from 1984 to 2001, forest harvesting under DEM review was undertaken on approximately 2,450 acres of forestland within the ACEC.

- Farmland

There are approximately 2,670 acres of farmland within the ACEC, 10% of the total ACEC area. This GIS land use coverage data can be separated into the following categories: cropland, 1,840 acres; pasture, 470 acres; orchard, 325 acres; and nursery, 35 acres. The largest amounts of cropland within the ACEC are located in Groton (approximately 1,310 acres) and Dunstable (395 acres). The largest amounts of pasture within the ACEC are located in Dunstable (approximately 205 acres) and Groton (195 acres). The orchards are located in Groton (approximately 325 acres).

The amount of land under the Chapter 61A farmland tax classification is approximately 1,885 acres, with 975 acres in Groton, 790 acres in Dunstable and 115 acres in Ayer.

Recognizing the importance of preserving as much high quality farmland as possible, the state Department of Food and Agriculture (DFA) has defined portions of the Petapawag ACEC as an Agricultural Preservation Restriction (APR) focus area. According to DFA, an APR focus area, or block, is an area that encompasses Class I-IV soils (as defined by the United States Department of Agriculture, Natural Resource Conservation Service), is currently being farmed, and generally consists of several farms. The acreage varies but is generally over 30 acres of tillable cropland.

The amount of farmland protected under APRs within the ACEC is approximately 360 acres. Currently there is one farm property in Dunstable (approximately 130 acres) and four orchard (one with vegetable production) properties in Groton (approximately 230 acres) included under the APR Program,

administered by the DFA. According to the DFA, there is the potential for additional APRs in Dunstable and Groton, indicating the future potential for blocks of farmland to remain productive and sustainable in this area. Also according to the DFA, there are pockets of fertile land (prime agricultural soils and agricultural soils of state significance) within the area, especially in Dunstable and the southwestern area of Groton. Fertile floodplain areas support a wide variety of agricultural crops from vegetables to hay. The drumlins that support orchard crops also provide pasture and area for forage crops.

The amount of farmland covers approximately 10% of the ACEC. There are concentrations of farmland in various parts of the ACEC that add significance to farmland as an important part of the overall resource framework of the ACEC, and that indicate that the preservation of farmland is an important goal for future stewardship activities within the ACEC.

Water Supply Areas

There are significant drinking water resources present within the ACEC. These include a relatively small high-yield aquifer as defined by the United States Geological Survey (USGS) in the area of Reedy Meadow Brook in Pepperell and Groton, a small portion of a high-yield aquifer along the Nashua River in Ayer, and medium-yield aquifers along several streams and ponds within the ACEC. The medium-yield aquifers are located in the following areas: along Reedy Meadow Brook in Groton and Pepperell; Unkety Brook in Groton and Pepperell; Martins Pond Brook in Groton; along the extensive corridor of Knops Pond/Lost Lake/Whitney Pond/Cow Pond Brook/Massapoag Pond/Salmon Brook in Groton, Tyngsborough and Pepperell; along the Nashua River in Ayer; and along a corridor in Ayer adjacent and to the south of Flannagan, Sandy, and Long Ponds. The area of the high-yield aquifers is approximately 85 acres. The area of these medium-yield aquifers is 2,440 acres, or 10% of the ACEC. The medium- and high-yield aquifers in Ayer are connected to more extensive high-yield aquifers and additional public water supplies along the Nashua River in Ayer, Groton and Shirley, and adjacent to and south of Grove Pond in Ayer.

According to GIS mapping and recent DEP data, there are five municipal wells located within the ACEC, in Dunstable, Groton and Pepperell.

Town	**# of wells**	**% of total town public water supply provided**
Dunstable	1	100%
Pepperell	2	43%
Groton	2	7%
Groton outside of ACEC	2	43%

It is important to note that two Groton public supply wells are located just outside of the ACEC, east of Whitney Pond, and provide approximately 43% of the town's annual public water supply. A portion of the Zone II wellhead protection area for these wells is located within the ACEC. The Zone II and Interim Wellhead Protection Areas for all of these wells cover approximately 1,870 acres, or 7% of the ACEC. The combined area of high- and medium-yield aquifers and the Zone II and Interim Wellhead Protection Areas for current water supply facilities totals approximately 3,570 acres, or 14% of the ACEC.

The Groton and Pepperell wells described above, and the two additional municipal wells for Groton and Pepperell located within the Squannassit ACEC, provide 100% of those towns' public water supply.

There are also extensive areas throughout the ACEC that rely on private on-site wells for residential or commercial use.

The significance of these public water supplies is further described in section IV. Summary of the Criteria for Designation.

Historical/Archaeological Resources

According to nomination review comments provided by DEM's Office of Historic Resources archaeologist Thomas Mahlstedt, glacial history provides the context for an understanding of the archaeological and historic resources within the Nashua River region and the area of the Petapawag ACEC. He states,

> The composition of the bedrock, together with glacial and post-glacial deposition, and erosion have created a mosaic of landforms, sediments and soils. These characteristics combined with a diverse flora and fauna base, gave the region a complexity and variety that contributed to the many forms of land use practiced throughout the 12,000 years that humans have occupied the region ….
>
> The biota of the region includes wetlands, pine and hardwood forests, pioneer hardwood and herbaceous forests, and open floral communities. The wetlands, riverine floodplains, and interior wooded uplands attract, or did attract, virtually every form of wildlife known in the northeastern part of the United States …. Paleo Indian hunters and gatherers may have reached the Nashua River Drainage sometime between 12,000 to 9,500 years ago.

Given the unique environmental characteristics and favorable site location criteria of the Petapawag and Squannassit regions, he suggests that the area contains exceptionally high archaeological potential, both for the numbers of sites yet to be discovered, as well as for sites that are known to retain high archaeological integrity and research value – in other words, "the region is a veritable archaeological museum."

The Nashaway, a band of a broader group of Algonquin speaking peoples, inhabited the area prior to colonial settlement. The Nipmuc, Massachusetts and Pennacook tribes may have all hunted or inhabited portions of the area. The name, Petapawag, is referred to in the original grant of Groton Plantation (which covered an extensive area that included communities beyond the present boundary of Groton), which referred to the area as "formerly known by the name of Petapawag."

In written comments regarding the nomination submitted by the Massachusetts Historical Commission (MHC), MHC states that the ACEC includes a wide range of significant historic and archaeological properties. Known archaeological sites within the area, associated with Native American settlement of the area, date back 3,000 years. The MHC's Inventory of the Historic and Archaeological Assets of the Commonwealth lists more than 350 properties within the Squannassit and Petapawag nominated areas, including historic districts in the Petapawag area. MHC states, "Surviving eighteenth and nineteenth century structures and landscapes have helped preserve the historic character of this area," and concludes that the ACECs contain significant historic and archaeological resources.

There are three Historic Districts located within the Petapawag ACEC in Groton that are listed in the Massachusetts State Register of Historic Places. These are Groton Historic District #1 and #2, located along Main Street in the Groton Center area, and District #3, located along Farmer's Row. These Historic Districts are part of or are surrounded by scenic landscapes included in the 1982 Massachusetts Scenic Landscape Inventory prepared by the Department of Environmental Management (see below under Significant Scenic Sites). The historic districts, and the historic structures found thoughout this area, take on added significance in the context of these scenic landscapes. These landscapes within the ACEC are referred to by MHC as some of the "surviving eighteenth and nineteenth century landscapes [that] have helped preserve the historic character of this area."

In addition, as stated in the Petapawag Nomination Report, the Nashua River corridor is located at the center of the Freedom's Way National Heritage Area, which highlights American history through its programs on Rediscovering the Native Landscape, Inventing the New England Landscape, and Shaping the Landscape of Democracy.

The Petapawag Nomination Report provides additional information regarding historic resources. Also, subsequent to the submission of the Nomination Report to my office on March 25, 2002, the nominators provided a great deal of additional local archaeological and historical information. These materials are on file with the ACEC Program.

Special Use Areas

The ACEC regulations cite "undeveloped or natural areas, public recreational areas, or significant scenic sites" as examples of "special use areas." These areas are a central feature of the ACEC.

- Undeveloped or Natural Areas

As described above in this Resource Overview section, especially under Habitat Resources, there are extensive undeveloped or natural areas located throughout the Petapawag ACEC. These areas also overlap with the major protected open space lands described below under Public Recreational Areas.

- Public Recreational Areas

There are extensive public recreational areas within the ACEC. The GIS maps provided for the nomination review show the location and extent of federal, state, municipal and privately owned open space, almost all of which is open to the public. Municipal open space not open to the public may include land owned and managed for public water supply protection. Privately owned open space generally refers to lands owned by local or regional nonprofit land trusts and conservation organizations. Protected open space does not refer to properties under Chapter 61A (farming), 61 (forestry), and 61B (recreation) tax classification status. The state DEM's Division of Forests and Parks, the state Division of Fisheries and Wildlife (DFW), and various towns and nonprofit organizations own and manage significant areas of land.

Most of the towns included in the nomination area updated their local open space data during the summer and fall of 2002 to help provide the most current mapping for the reviews of the Squannassit and Petapawag ACEC nominations. Open space acreages and percentages within the ACEC, according to updated MassGIS data for the Petapawag ACEC, are:

Total	4,340 acres, or 17% of the ACEC
State	1,050 acres, or 4%
Municipal	1,360 acres, or 5%
Private Nonprofit	1,700 acres , or 7%

Detailed breakdowns by town and by ownership are available for further analysis and study, and for use in ongoing and future land and resource protection activities and programs.

Major conservation and recreation properties located within the ACEC

- DEM J. Harry Rich State Forest (505 acres) and Nashua River Rail Trail (130 acres)
- DFW Ayer Game Farm (100 acres)
- Ayer Pine Hill Pond Conservation Area (130 acres)
- Dunstable Town Forest (145 acres), Spaulding-Proctor area (165 acres), Tully Wildlife Refuge Area (155 acres), Kennedy/Tully Salmon Brook area (155 acres), and Unkety Brook area (75 acres)
- Groton Unkety Brook area (400 acres), Bates/Blackman/Hurd/Wiewel/Genther area (180 acres) and Shepley Hill/longley/Cronin area (175 acres)

In particular, the recently-constructed Nashua River Rail Trail is a highly significant recreational resource to the region. The Rail Trail is an 11-mile bicycle and pedestrian trail that runs northerly through Ayer, Groton, Pepperell and Dunstable to the New Hampshire line. The trail follows an old railroad bed located east of the Nashua River. It includes a five-foot wide gravel equestrian path for seven miles of the trail from Groton Center to the New Hampshire state line. No motorized vehicles are allowed on the trail. The Rail Trail also provides a recreation and conservation link to several open space properties, including J. Harry Rich State Forest, Shepley Hill, and Phoebe Keyes Woods.

In addition, the Nashua River is a regionally significant recreational resource area accessible to and highly used by the public, for recreational activities such as canoeing, fishing, hunting and nature study.

- Significant Scenic Sites

Within the Petapawag ACEC, portions of Ayer, Groton and Tyngsborough have been included in the 1982 Massachusetts Scenic Landscape Inventory prepared by the Department of Environmental Management. In the Inventory, "Distinctive" and "Noteworthy" classifications and maps are provided for about 9% of the Commonwealth's very best scenic landscapes, both of which are located within the ACEC. According to a digital layer of these landscapes adapted and incorporated into MassGIS, approximately 6,820 acres or 27% of the ACEC are Distinctive or Noteworthy scenic landscapes.

Most of the areas identified as scenic landscapes are located in Groton. There is a scenic corridor running along the Nashua River northerly to Pepperell, and a large contiguous area in the southwestern portion of the town adjacent to the Nashua River that extends in a northerly direction to include open farmlands, historic structures and districts (see Historical/Archaeological Resources above), and the distinctive complex of hills and eskers in the central area of the ACEC.

III. Boundary of the Petapawag ACEC

Upon review of the boundary as recommended in the nomination letter, oral testimony presented at the public hearing, correspondence submitted to the Secretary, and information gathered in the course of EOEA agency review, the final boundary of the Petapawag ACEC is slightly reduced in size as compared to the boundary proposed in the nomination, and includes two modifications described below. The final boundary also includes various technical clarifications, such as clarifying road names, and 200-foot Riverfront Areas and 100-foot wetland Buffer Zones. According to Geographic Information System (GIS) data provided by the Department of Environmental Management, the proposed boundary included approximately 25,900 acres. According to GIS data, the final ACEC boundary includes approximately 25,630 acres.

Discussion of Final ACEC Boundary

- Boundary Modifications

The final ACEC boundary, as compared to the boundary proposed in the March 25, 2002 ACEC nomination, was modified in 2 locations, both within the town of Ayer. These boundary modifications reduced the size of the nominated area to more closely approximate the location of important BioMap "Core Habitat" areas. These changes were located in the area south of Sandy Pond and in the vicinity of Route 2A and Route 11 north and west of the town center of Ayer.

- Proposals to Modify the Nominated Boundary

1. National Grid

Through testimony at a public hearing and in written correspondence by National Grid USA Service Company, Inc. ("National Grid")[1], I received comment expressing a concern as to the potential effect that ACEC designation, and a related "higher level of review attendant to [such] projects," may have upon permitting of activities in rights of way or corridors associated with the distribution or transmission of electricity. Specifically, National Grid appears concerned primarily as to how the ACEC designation will impact consideration of such activities by local and state governmental agencies, particularly under the Wetlands Protection Act, G.L c. 131, s. 40 and its regulations at 310 CMR 10.00, and the Massachusetts Environmental Policy Act ("MEPA") G.L. c. 30, ss. 61-62H and its regulations at 301 CMR 11.00. National Grid asserts that it conducts its management activities in an environmentally responsible manner and expresses its concern that the ACEC designation may serve, or may be used by others to serve the purpose, to add delay and cost to maintain, improve and upgrade its existing facilities, such as poles, wires, substations and ancillary support and construct new facilities within these currently managed and actively utilized corridors to meet the electric needs of the citizens of the Commonwealth.

Companies such as National Grid provide an essential service to the citizens of the Commonwealth through the distribution and transmission of electricity. Through the review of this ACEC nomination, I note that the existing managed corridors through which electricity is transmitted along wires strung from poles or other supporting structures are maintained to provide low growing vegetation without taller trees that may impact the transmission system. I note that such corridors when appropriately managed may provide important wildlife habitat and may sustain landscape biodiversity.

In response to the general concerns expressed by National Grid, I would like to state clearly that the inclusion of current electric transmission and distribution corridors within the boundary of the ACEC is intended neither to create a higher or different standard of review for projects within the currently managed and actively utilized corridors for transmitting or distributing electricity that qualify as public utility limited projects under the Wetlands Protection Act regulations, as described in 310 CMR 10.53(3)(d), nor to serve as the basis to deny such limited projects (i.e. operation and maintenance of transmission or distribution poles, wires, substations and ancillary facilities) that could otherwise have been permitted notwithstanding this ACEC designation decision.[2] Similarly,

[1] National Grid Companies include, in part, New England Power Company, Massachusetts Electric Company, and New England Hydro-Transmission Electric Company.

[2] This statement is intended as guidance for Conservation Commissions and the Department of Environmental

this ACEC designation is not intended to create a higher or different standard of review for such limited projects under MEPA. Therefore, when EOEA's MEPA Office is reviewing an Environmental Notification Form ("ENF") under MEPA and 301 CMR 11.00 for a project that (1) qualifies as a "limited project" under 310 CMR 10.53(3)(d)[3] and (2) that exceeds **only**[4] the MEPA threshold at 301 CMR 11.03(11), a rebuttable presumption will exist that the potential environmental impacts of such a project, within the standards of 301 CMR 11.06, will not require the preparation of an Environmental Impact Report ("EIR").[5] This presumption may be overcome only with substantial direct evidence submitted during the comment period on the ENF that aspects of the project which are within the applicable jurisdictional limitations of MEPA and 301 CMR 11.00 are likely, directly or indirectly, to cause significant damage to the environment and accordingly warrant the preparation of an EIR. I encourage project proponents, such as

National Grid, and the relevant local and state agencies to work proactively to appropriately address and mitigate potential environmental impacts, such as wetlands impacts.

2. Massachusetts Department of Highways (MassHighway)

The Massachusetts Department of Highways (MassHighway) requested that state highways under MassHighway jurisdiction be excluded from within the ACEC. Since the construction of improvements to state highways may have impacts to sensitive resources within the ACEC, it is important to include these roadways within the ACEC. It is important to note that routine maintenance is not subject to the ACEC review thresholds set forth in the Massachusetts Environmental Policy Act (MEPA) Regulations.

3. Individual Landowners Requesting Exclusion

Several individual landowners requested that their property be excluded because they were opposed to the nomination and designation process, thought that the proposed area was too broad, or thought that their land did not include at least four important resource features (the ACEC Regulations state that to be eligible for nomination, an area shall contain at least four features listed in the regulations). However, the boundaries proposed by the nominators were consistent with the central resource features and goals of the nomination, and followed ACEC Program guidelines to delineate the proposed boundary.

As part of the review of the nomination, I conducted a site visit to an area in Dunstable to meet with residents who own and farm extensive properties within the ACEC. In response to the concerns voiced to me, it is important to state that these agricultural areas are an integral part of the landscape and ecology of this area. ACEC designation is intended to encourage and support family

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Protection for their reviews conducted under the Wetlands Protection Act and associated regulations. Nothing in this statement purports to effect the application of 310 CMR 10.53(3)(d), particularly the review of projects relative to projects in rare species habitat.

[3] EOEA will identify whether a proposed project qualifies as a "limited project" for MEPA review purposes from the review documents and from comments, with particular emphasis upon comments received from the Department of Environmental Protection.

[4] This rebuttable presumption would not apply if another MEPA review threshold was exceeded (e.g. any of the discretionary thresholds at 301 CMR 11.03(3)(b)) while noting that the thresholds at 301 CMR 11.03(3)(a) require preparation of an EIR.

[5] This rebuttable presumption applies only for purposes of MEPA and determining whether an EIR must be prepared under MEPA. This presumption does not and could not serve any other purpose or effect any presumption under the Wetlands Protection Act, including whether and to what extent a project may alter a wetlands resource area or have an adverse effect, the availability of reasonable alternatives, or the extent to which mitigation measures are necessary.

farms and the long-term viability of farming in this area. It does not and should not place additional regulatory burdens on farms and farming.

4. Proposals to Expand the Proposed Boundary – Salmon Brook Corridor

Suggestions to expand the proposed ACEC boundary were submitted in the course of the review, especially an area referred to as the Salmon Brook corridor in Groton, Tyngsborough and Dunstable. This proposed expansion is not included in this designation. However, I find that these suggestions to expand the boundary in this area have strong merit, and deserve further consideration as a potential future amendment to the ACEC by the communities who share this resource area. This area includes the interconnected water bodies running north from Knops Pond in Groton to Salmon Brook in Dunstable, just outside of and to the east of the ACEC. The area includes BioMap Core Habitat and Suporting Natural Landscape areas, a portion of the Unkety Brook (Herp) Habitat Reserve, additional rare species habitat, several tributary streams flowing westerly into the lakes, ponds, streams and wetlands of the ACEC, numerous wetlands and Potential Vernal Pools, a medium yield aquifer and public supply wells and Zone II wellhead protection areas for the Town of Groton and Dunstable.

Overview of Petapawag ACEC Boundary Description

The Petapawag ACEC boundary includes portions of the Nashua River Watershed and Merrimack River Watershed. The Petapawag ACEC is generally bounded by the Nashua River corridor to the west, the New Hampshire state line to the north, the Knops Pond-Lost Lake-Whitney Pond-Cow Pond Brook-Massapoag Pond-Salmon Brook corridor to the east, and the Long Pond-Sandy Pond-Flannagan Pond corridor to the south. It is important to state that in some locations there are highly important resources just outside of or nearby the final ACEC boundary.

According to Geographic Information System (GIS) data provided by MassGIS and DEM, the final ACEC boundary includes approximately 25,630 acres, with approximate amounts in each town as follows:

Ayer	1,960 acres
Dunstable	6,610 acres
Groton	14,950 acres
Pepperell	2,040 acres
Tyngsborough	70 acres

- **Great Ponds and Navigable Rivers and Streams as Determined by the State Waterways (or Chapter 91) Regulations (310 CMR 9.00)**

The final boundary includes several Great Ponds and navigable rivers and streams as determined by the Massachusetts Waterways (or Chapter 91) Regulations (310 CMR 9.00), administered by the state Department of Environmental Protection. **These Great Ponds and waterways will be included within the boundary of the Petapawag ACEC, but the effective date for these areas will be within a period of up to five years following the date of this ACEC designation**. Further study and resource management planning for these water bodies is needed before they can be included within the boundary of the ACEC. **The effective date that these water bodies will be included as part**

of the ACEC is as follows (whichever date is earliest), in accordance with 301 CMR 12.11(1):

a) five years from the initial effective date of designation; or
b) the effective date of approval by the Secretary of Environmental Affairs of a Resource Management Plan (RMP) for a specific water body, after the RMP has been adopted by the municipality or municipalities where the water body is located; or
c) the date of publication in *The Environmental Monitor* of a Finding by the Secretary that adequate study and public education, outreach and participation have been completed for a specific water body or water bodies, and that formal Resource Management Plan adoption and approval is not necessary.

- **Boundary Definitions**

The boundary of the Petapawag ACEC generally follows:

- streets, roads, railroad, and utility rights-of-way or easements;
- state and town boundary lines;
- a line following the outer edge of the Buffer Zone (as defined in 310 CMR 10.04, that area of land extending 100 feet horizontally from the boundary of any area specified in 310 CMR 10.02 (1)(a) - areas specified in 310 CMR 10.02(1)(a) include any bank, freshwater wetland, marsh, or swamp bordering on any creek, river, stream, pond or lake); and/or
- a line following the outer boundary of Riverfront Area (as defined in 310 CMR 10.58(2)(a) and 10.58(2)(a)3. – for most locations, Riverfront Area is the area of land between a river's mean annual high-water line measured horizontally outward from the river (perennial stream) and a parallel line located 200 feet away).

Where the ACEC boundary is defined by the location of natural resource features (e.g. *wetland resource areas*), the boundary may be subject to clarification based on the most current definitions and data for the resource areas. For a review of site specific projects within the ACEC, the ACEC boundary may need to be determined in the field or in consultation with the ACEC Program. Actual field verification of the 100-foot wetlands Buffer Zone or the 200-foot Riverfront Area would be determined during the course of filing, by a project proponent to the Conservation Commission of the appropriate town, either a Request for Determination of Applicability or a Notice of Intent following the procedures specified in the Wetlands Protection Act, M.G.L. Ch. 131, sec. 40, and its regulations at 310 CMR 10.00. *Only for purposes of delineating this ACEC boundary*, the 200-foot Riverfront Area takes precedence over the 100-foot wetlands Buffer Zone. However, where a 200-foot Riverfront Area is specified as the ACEC boundary, based upon the location of a presumed perennial stream, and said stream is later determined by the Conservation Commission or the DEP to be intermittent and therefore would not contain Riverfront Area, the ACEC boundary will revert to the 100-foot wetlands Buffer Zone in that location.

Unless otherwise specified, the ACEC boundary as described extends to and includes the entire width of the *rights-of-way* of public and private streets, roads and highways and other rights-of-way such as railroads and utility easements. Where rights-of-way are used to delineate the boundary for areas within the external perimeter that are not intended for inclusion within the ACEC, the entire width of the rights-of-way are intended to be included as part of the ACEC.

The final boundary is approximated by the digital boundary shown on the attached maps based on the Ayer, Lowell, and Townsend 1988 USGS 7.5 minute series, 1:25,000-scale metric topographic quadrangle maps. An official map is on file at the offices of the DEM, Division of Resource Conservation, ACEC Program, and can be viewed online at the ACEC Program web site:

www.state.ma.us/dem/programs/ACEC. The digital ACEC boundary will be available in 2003 in the ACEC datalayer that can be downloaded from the MassGIS web site: www.state.ma.us/mgis. Because approximate locations of wetlands shown on these maps are based on best available digital data, the digital ACEC boundary will be updated in the future when better digital wetlands data becomes available.

Boundary description of the Petapawag ACEC

State line	1. Commencing at the northwestern corner of the ACEC at the intersection of the 200-foot Riverfront Area to the west of the Nashua River in **Dunstable** and the Massachusetts/New Hampshire state line, thence following eastwards along the Massachusetts/New Hampshire state line to the intersection of the 200-foot Riverfront Area east of Salmon Brook.
200-ft Riverfront Area	2. Thence southward along the 200-foot Riverfront Area east of Salmon Brook until reaching the intersection with the 100-foot wetlands Buffer Zone north of the northern tip of Lower Massapoag Pond near Rte. 113.
100-ft Wetlands Buffer Zone	3. Thence southward along the 100-foot wetlands Buffer Zone to the east of Lower Massapoag Pond until reaching the intersection with the 200-foot Riverfront Area of Salmon Brook.
200-ft Riverfront Area	4. Thence southward along the 200-foot Riverfront Area east of Salmon Brook to its intersection with the 100-foot wetlands Buffer Zone of Massapoag Pond.
100-ft Wetlands Buffer Zone	5. Thence southward along the 100-foot wetlands Buffer Zone east of Massapoag Pond crossing into **Tyngsborough** until reaching the 200-foot Riverfront Area of Salmon Brook again.
200-ft Riverfront Area	6. Thence southward along the 200-foot Riverfront Area east of Salmon Brook and crossing Groton Rd. until reaching the 100-foot wetlands Buffer Zone of Upper Massapoag Pond.
100-ft Wetlands Buffer Zone	7. Thence southward along the 100-foot wetlands Buffer Zone east of Upper Massapoag Pond crossing into **Groton** until reaching the 200-foot Riverfront Area of Cow Pond Brook
200-ft Riverfront Area	8. Thence southward along the 200-foot Riverfront Area east of Cow Pond Brook until reaching the 100-foot wetlands Buffer Zone of the wetlands associated with Cow Pond Brook near Bridge St.
100-ft Wetlands Buffer Zone	9. Thence southward on the eastern border of the 100-foot wetlands Buffer Zone of these wetlands, and continuing along the 100-foot wetlands Buffer Zone east of Whitney(Cow) Pond until reaching the 200-foot Riverfront Area of Cow Pond Brook.
200-ft Riverfront Area	10. Thence southward along the 200-foot Riverfront Area east of Cow Pond Brook until reaching the 100-foot wetlands Buffer Zone of Lost Lake.
100-ft	11. Thence southward along the 100-foot wetlands Buffer Zone east of Lost Lake

Wetlands Buffer Zone	and the contiguous Knops and Springy Ponds until reaching Shelters Rd.
Road	12. Thence southward on Shelters Rd. until its junction with Rte.119/Boston Rd.
Road	13. Thence eastward on Rte. 119/Boston Rd. until its junction with Sandy Pond Road.
Road	14. Thence southward on Sandy Pond Rd. becoming Westford Rd. in **Ayer** until the junction with Sandy Pond Rd. again, this time in Ayer.
Road	15. Thence westward along Sandy Pond Rd. until it's junction with Central Ave.
Road	16. Thence westward along Central Ave. until the intersection with Groton-Harvard Rd.
Road	17. Thence northward on Groton-Harvard Rd. until reaching the southern edge of the power line right-of-way.
Powerline	18. Thence northwesterly along the southern edge of the power line right-of-way until reaching the DFW Ayer State Game Farm.
Public Property line	19. Thence generally southerly, westerly, and northerly around the property line of the Ayer State Game Farm until meeting the 100-foot wetlands Buffer Zone to its west.
100-ft Wetlands Buffer Zone	20. Thence northerly along the western edge of the 100-foot wetlands Buffer Zone until reaching the southern edge of the power line right-of-way.
Powerline	21. Thence westward along the southern edge of the power line right-of-way to its junction with the centerline of the Nashua River.

River centerline	22. Thence northward on the centerline of the Nashua River (which also follows portions of the town lines of **Ayer** and **Shirley,** the town lines of **Ayer** and **Groton**, and the town lines of **Groton** and **Pepperell,** where coincident with the centerline of the Nashua River) until reaching its crossing of Rte. 119/Rte. 111 (South Rd. in Pepperell).
Road	23. Thence westward on Rte. 119/Rte. 111 into **Pepperell** until the junction with northbound Rte. 111.
Road	24. Thence northward on Rte. 111/River Rd. until its junction with Canal St.
Road	25. Thence northward on Canal St. until its junction with Rte. 113/Main St. and Mill St.
Road	26. Thence northward on Mill St. until reaching the 200-foot Riverfront Area north of the Nissitissit River.
200-ft Riverfront Area	27. Thence eastward along the 200-foot Riverfront Area north of the Nissitissit River until reaching the 200-foot Riverfront Area west of the Nashua River.
200-ft Riverfront Area	28. Thence northward along the 200-foot Riverfront Area west of the Nashua River until reaching the Massachusetts/New Hampshire state line, completing the perimeter of the Petapawag ACEC.

IV. Summary of the Criteria for Designation

In the review process leading to the designation of a nominated area, the Secretary must consider the factors specified in 301 C.M.R. 12.09 of the ACEC Regulations regarding the designation of Areas of Critical Environmental Concern. As stated in the regulations, the factors need not be weighed equally, nor must all of these factors be present for an area to be designated. The strong presence of a single factor may be sufficient for designation.

Based on the information presented in the letter of nomination, at the public hearing, in written comments received throughout the public review process, and in agency research and review, I find the following factors relevant to the designated ACEC.

(1) Threat to the Public Health through Inappropriate Use

According to comments provided by state agency reviewers, there are significant drinking water resources present within the ACEC. The combined area of high- and medium-yield aquifers and the Zone II and Interim Wellhead Protection Areas for current water supply facilities totals approximately 3,570 acres, or 14% of the ACEC. The medium- and high-yield aquifers in Ayer are connected to more extensive high- yield aquifers and additional public water supplies along the Nashua River in Ayer, Groton and Shirley, and adjacent to and south of Grove Pond in Ayer. According to GIS mapping and recent DEP data, there are five municipal wells located within the ACEC, in Dunstable, Groton and Pepperell.

There are also extensive areas throughout the ACEC that rely on private on-site wells for residential or commercial use.
According to comments provided by Nashua Watershed Team Leader Jo Anne Carr,

> The local groundwater resources are the most practical water supply for all of the communities within the proposed ACECs. To date none of the supplies have been compromised due to poor water quality. In the future, however, surface and groundwater quality and quantity is expected to present a problem due to pressing demand with increased growth and development. Recent buildout analyses completed by the Executive Office of Environmental Affairs, Community Preservation Initiative projects water demand to exceed present safe yields of groundwater resources.

According to comments provided by DEM's Office of Water Resources,

> This area includes a public water supply well at Baddacook Pond and the Town's Shattuck well. These are part of Groton's public water supply system, which serves 100% of Groton's population. (CDM Nashua River study). Groton's population is expected to increase from 9,509 (2000) to 13,241 (2020), an increase of 40% above the current population, which will also bring additional water needs in the future.
>
> The area also contains two of Pepperell's wells, which are used for the public water supply. Pepperell's population is expected to increase from 11,142 (2000) to 13,975 (2020), or by 25% above the current population, and will have an associated increase in water supply needs (CDM Nashua River Study).
>
> The Salmon Brook supply serves the Dunstable Water District. This appears to be a relatively small public water supply system within the Merrimack River valley drainage area.
>
> Each of these wells have associated wellhead protection areas at least in part within the proposed ACEC area; thus we anticipate there would be a threat to public health through inappropriate use.
> It appears that both of the proposed ACEC's contain public water supply sources in towns that are projected to undergo significant growth over the next 20 years. ACEC designation should help to reinforce protection of the water supply sources.

I find that the water resources and public drinking water supplies of the ACEC as described above are a significant part of the overall resource framework of the ACEC, and a significant threat to the public health exists through inappropriate uses.

(2) Quality of the Natural Characteristics

The high quality of the natural characteristics of the ACEC is described extensively in the Petapawag ACEC Nomination Report and in public comments received during the public review.

The extensive and diverse wildlife habitat includes 13,910 acres of "Core Habitat" and 3,720 acres of "Supporting Natural Landscape," as documented by the BioMap report published in 2001 by the state's Natural Heritage & Endangered Species Program (NHESP).

According to the NHESP,

> The BioMap project of NHESP delineated as Core Habitat those areas of the state which, if protected, would protect the most viable populations of rare plants and animals and the best examples of natural communities. Twenty-three percent of the entire state was delineated as Core Habitat. In the Southern New England Coastal Plains and Hills ecoregion, which includes the proposed Petapawag ACEC, only 15% of the ecoregion is Core Habitat. About 54% of the proposed Petapawag ACEC is Core Habitat.

This high percentage of Core Habitat relative to both the state as a whole and to the ecoregion indicates the very high biodiversity value of the proposed Petapawag ACEC.

In addition to Core Habitat, approximately 15% of the ACEC is Supporting Natural Landscape, which is defined by NHESP as large, minimally fragmented areas that safeguard the Core Habitat while also including habitat for the common species of Massachusetts.

Also according to the NHESP, the known documented records from the Natural Heritage database indicate that there are 16 state-listed rare species known to occur within the boundaries of the Petapawag ACEC, further reflecting the high quality of the natural characteristics of the ACEC.

Most of the 18,000-acre Unkety Brook ("Herp") Habitat Reserve is located within the ACEC, as well as a portion of the 6,700-acre Squannacook ("Herp") Habitat Reserve, again reflecting the high quality of the natural characteristics of the ACEC.

Rare species habitat and biodiversity are further described below under Uniqueness of the Area.

Productive cold water fisheries are found in several rivers and streams, particularly Unkety Brook.

I find that this criteria alone - Quality of the Natural Characteristics - is sufficient for designation.

(3) Productivity

As described above in the Quality of the Natural Characteristics and below in the Uniqueness of the Area, the Petapawag resource area is rich in hosting a high diversity of wildlife. Preserving these unfragmented ecosystems is a key to preserving biodiversity and the productivity of native habitats in Massachusetts. The ACEC includes highly productive aquifers, used for important public water supplies. There are also productive farmlands and forestlands within the ACEC.

(4) Uniqueness of the Area

The uniqueness of the area, like the Quality of the Natural Characteristics described above, is sufficient to support ACEC designation. As stated above, there are 16 state-listed rare species known to occur within the ACEC. These include seven Endangered Species, one Threatened, and eight listed as species of Special Concern. One of the Endangered Species is also federally-listed as Threatened. Rare species habitat is located in 18 different areas of the ACEC, and covers approximately 2,560 acres or 10% of the ACEC. The NHESP states that several of these rare species occurrences stand out as particularly significant, as follows:

- For a state-listed plant that is listed as Endangered and that is also federally-listed as Threatened, there are five current locations known state-wide; one is a small population in the proposed Petapawag ACEC. Globally, this species is considered to be Imperiled, which typically means there are only 6 to 20 occurrences, or 1,000 to 3,000 individuals, world-wide.
- A state-listed dragonfly that is listed as Endangered is rare throughout its global range and was proposed for Federal listing at one point. While this species was not included in the nomination document for the Petapawag ACEC as it had not been documented from the proposed ACEC at the time of the nomination, it has now been documented in the designation area. The site in the proposed ACEC is the only occurrence in the Nashua River watershed.
- For another Endangered plant, there are only two current known sites for this plant in the state, one in Greenfield and one in Groton in the proposed Petapawag ACEC.

- For another Endangered dragonfly, the Nashua River is one of only two sites in the state for this species.
- For an endangered aquatic plant, there are seven current sites state-wide for this species; however, several of these populations have not been relocated in recent years. The population of this plant in the proposed Petapawag ACEC is one of the two largest in the state.

In addition to information provided about state-listed rare species habitat and biodiversity (the BioMap Project), the NHESP also provided information regarding Rare Reptile and Amphibian Reserves (Herp Reserves) and Vernal Pools.

In regard to Rare Reptile and Amphibian Reserves (Herp Reserves), NHESP states:

> The proposed 18,000-acre Unkety Brook Herp Reserve includes the northern half of the proposed Petapawag ACEC, plus small areas east and west of the proposed ACEC boundaries…. This herp reserve is the largest (in acreage) of the herp reserves delineated across the state. As the Natural Heritage report on the project states, "…the Unkety site may be key to the persistence of Blanding's turtles in Massachusetts and may be essential to maintaining connectivity with populations of target species in New Hampshire and Maine."
>
> Freshwater rare reptiles and amphibians are particularly threatened state-wide by development, as the animals' movements from wintering to breeding to feeding sites during the year are easily blocked by roads and development. Turtles, especially, are exceptionally vulnerable to dying on roadways. Because of turtles' low rate of successful reproduction, even a low adult mortality rate of 1% a year can doom a population over the long term.

The NHESP adds that the inclusion of one of these herp reserves within the Petapawag ACEC, out of only nine statewide, is a strong argument for the biodiversity value of this area. Furthermore, as mentioned above in the Summary Description of the Resources of the Petapawag ACEC, Habitat Resources, and under Quality of the Natural Charateristics, an important portion of another herp reserve, the 6,700-acre Squannacook Herp Habitat Reserve, is also located within the ACEC. Thus portions of two of only nine herp reserves statewide are located within the ACEC, further emphasizing the biodiversity value of the area.

In regard to Vernal Pools, the NHESP has also provided evidence to support designation (see the Habitat Resources section above). NHESP states,

> The proposed Petapawag ACEC includes reported sites for five of these eight rare species [that use vernal pools]. The high density of vernal pools within the boundaries of the proposed ACEC is very likely a major factor in the presence of these five species.
>
> In fact, the proposed ACEC encompasses a considerably higher density of Potential Vernal Pools than the average across the state. The Natural Heritage Program recently mapped the locations of probable vernal pools through aerial photointerpretation and collated the locations into a GIS datalayer of Potential Vernal Pools (PVPs). While not all of these locations will turn out to be real, certifiable vernal pools when checked on the ground, a high percentage will be functioning vernal pools. State-wide there is an average density of 5.574 Potential Vernal Pools per 1000 acres. In the proposed Petapawag ACEC, the average PVP density is 12.857 PVPs per 1000 acres, 2.3 times the state average. The Town of Groton, which is almost entirely within the proposed Petapawag ACEC, has a particularly high number of PVPs, for an average of 16.422 per 1000 acres, almost three times the state average.
>
> Thus, because of the high numbers of vernal pools within the boundaries of the proposed ACEC, this area is particularly well-suited to supporting viable populations of rare vertebrates dependent on these uncommon habitats.

Finally, as stated above, as part of the statewide BioMap project, approximately 13,910 acres or 54% of the ACEC are designated Core Habitat, and 3,720 acres or 15% are Supporting Natural Landscape.

The NHESP summarizes its comments as follows:

> The unique biological value of the nominated Petapawag ACEC lies in its exceptional concentration of vernal pools, the relatively unfragmented nature of its landscape, the high percentage delineated as BioMap Core Habitat, and its wealth of state-listed rare species. With the accelerated pace of human development and sprawl in the northeastern part of the state in recent decades, the protection of such a rich area, through every means possible, becomes ever more needed. The designation of this area as an ACEC provides the opportunity for state and local agencies, officials, and citizens to educate themselves about the unique attributes of this area, to plan wisely for its sustainable development, and to protect its natural resources.

According to the Criteria for Designation listed in the ACEC Regulations, "Uniqueness" also applies to archaeological and historic, or cultural, features, which support designation.

In written comments regarding the nomination submitted by the Massachusetts Historical Commission (MHC), MHC states that the ACEC includes a wide range of significant historic and archaeological properties. Known archaeological sites within the area, associated with Native American settlement of the area, date back 3,000 years. The MHC's Inventory of the Historic and Archaeological Assets of the Commonwealth lists more than 350 properties within the Squannassit and Petapawag nominated areas, including historic districts in the Petapawag area. MHC states, "Surviving eighteenth and nineteenth century structures and landscapes have helped preserve the historic character of this area." MHC concludes that the ACECs contain significant historic and archaeological resources.

In addition, as stated in the Petapawag Nomination Report, the Nashua River corridor is located at the center of the Freedom's Way National Heritage Area, which highlights American history through the themes of Rediscovering the Native Landscape, Inventing the New England Landscape, and Shaping the Landscape of Democracy.

According to review comments provided by DEM archaeologist Thomas Mahlstedt, the wetlands, riverine floodplains, and interior wooded uplands attract, or did attract, virtually every form of wildlife known in the northeastern part of the United States. Paleo Indian hunters and gatherers may have reached the Nashua River Drainage sometime between 12,000 to 9,500 years ago. Given the unique environmental characteristics and favorable site location criteria of the Petapawag and Squannassit regions, he suggests that the area contains exceptionally high archaeological potential, both for the numbers of sites yet to be discovered, as well as for sites that retain high archaeological integrity and research value – in other words, "the region is a veritable archaeological museum." He states that the archaeological resources within the nomination area are unique records of past human behavior, sometimes resulting from a single activity or event, and sometimes from hundreds and even thousands of years of repeated use. The potential survival of many intact and well preserved archaeological sites within the nomination area makes it one of the most important areas for research about our heritage within the Commonwealth.

Finally, according to the Criteria for Designation listed in the ACEC Regulations, "Uniqueness" also applies to geologic features. As stated in the Petapawag Nomination Report,

> A cluster of drumlins runs generally in a north-south line through the central portion of Groton. These

drumlins are one of the most amazing and distinctive remnants of the glacial period. The Groton Drumlin Swarm delineated (on a Figure 9 of the report) includes Baralock Hill, the Chestnut Hills, Gibbet Hill, Brown Loaf, Prospect Hill, Indian Hill, and Chapel Hill, along with other unnamed drumlins. There are a total of 14 drumlins with 26 distinct summits in this 2,383-acre swarm; there are 8 double and 2 triple drumlins.

I find that the value and significance of the resource combinations described above – endangered plant and animal species, archaeological/historic/cultural features, and geologic features – more than meet the criteria of uniqueness of the area for ACEC designation.

(5) Irreversibility and Magnitude of Impact

Preserving and providing for the stewardship of the unique and high quality resource features of this ACEC is a daunting challenge in the face of growing development pressures in this part of the Commonwealth, which is located just outside of I-495 and north of Route 2. Based on previous experience in other parts of the Northeast, adverse impacts to public water supplies, surface water quality, rare species habitat, and biodiversity that are probable with intensive development would be irreversible. ACEC designation provides a framework for intermunicipal, intergovernmental, and community-regional interaction that can encourage and enable stewardship of these resources, balancing economic and environmental needs.

(6) Imminence of Threat to the Resource

As stated above, this area is facing strong and unrelenting growth and development pressures. I find that these pressures are an imminent threat to the resources, character and quality of life of these communities and the region.

(7) Economic Benefits

The intrinsic natural, cultural and historic values of the area, and the wise preservation and management of these resources, will help support the quality of life of the ACEC communities, and thus provide indirect long-term economic benefits to the towns. Farmland covers approximately 10% of the ACEC, and is an important element of the overall resource framework of the area. According to the Department of Food and Agriculture (DFA), the ACEC includes portions of an Agricultural Preservation Restriction (APR) focus area, with commercially active farming areas to help support farm related businesses such as tractor dealerships, feed and grain establishments, and local supermarkets. The inclusion of the Nashua River Watershed and portions of the Petapawag ACEC as a Forest Legacy Area, one of six such areas in the Commonwealth, underscores the importance of long-term economic benefits through sound forest resource management and stewardship. The economic benefits to areas that provide passive recreation and ecotourism opportunities are well-known in other regions of the state, and are likely to become more important in this region. Furthermore, the protection and preservation of surface water quality and the aquifers located within the ACEC that provide current public water supplies, as well as potential future supplies, will yield long-term economic benefits.

(8) Supporting Factors

The public review process for the Petapawag nomination demonstrated very strong support for ACEC designation. There is strong public consensus and awareness regarding the intrinsic value of the area and

its importance. The pioneering and continued landmark activities and programs of the Nashua River Watershed Association, and the strong conservation ethic of the communities of the ACEC, provide hope and inspiration for further public education and environmental resource stewardship for the ACEC.

- Summary of Comments

Approximately 250 comments plus a petition with 42 signatures were received in the course of the public participation process for the Squannassit and Petapawag ACEC nominations. Overall, approximately 200 comments supported ACEC designation and 35 opposed designation (others did not indicate a position), plus a petition with 42 signatures opposed designation. Comments addressed either or both of the nominations. Approximately 14 letters of support for the nomination(s) were submitted from town boards, committees and commissions from the five towns located within the Petapawag ACEC, as follows: Ayer Historical Commission; Dunstable Planning Board and Conservation Commission; Groton Board of Selectmen, Planning Board, Conservation Commission, Greenway Committee, Historic Districts Committee, and Trails Committee; Pepperell Planning Board, Conservation Commission, and Board of Health; and the Tyngsborough Conservation Commission and Community Preservation Committee. At the public hearing the Chairperson of the Dunstable Board of Selectmen stated that a majority of the Board supported ACEC designation. There were no letters from town boards, commissions or committees opposing designation.

State legislators representing towns within the ACEC who wrote letters of support included Senators Robert A. Antonioni, Steven C. Pangiotakis and Pamela P. Resor and Representatives Geoffrey D. Hall, Brian Knuuttila, and Patricia A. Walrath. Several federal or state agencies provided formal or informal comments and information, including the state Department of Environmental Protection; the state Division of Fisheries and Wildlife (DFW) and the DFW Natural Heritage & Endangered Species Program; the Division of Fisheries, Wildlife and Environmental Law Enforcement (DFWELE) Riverways Program; the state Department of Environmental Management (DEM) Division of Forests and Parks (DFP) and DFP Bureau of Forestry; the DEM Division of Resource Conservation Office of Water Resources, Office of Natural Resources, and Office of Historic Resources; the state Department of Food and Agriculture; the Massachusetts Watershed Initiative of the Executive Office of Environmental Affairs; the Massachusetts Historical Commission; and the Massachusetts Highway Department.

Letters of support were submitted from several organizations, including the Freedom's Way Heritage Association, Groton Conservation Trust, Massachusetts Audubon Society, Massachusetts Watershed Coalition, Massapoag Rod & Gun Club, Merrimack River Watershed Council, Nashua River Watershed Association, Nashoba Conservation Trust, New England Forestry Foundation, North County Land Trust, PACE (People of Ayer Concerned about the Environment), The Trustees of Reservations, and Trout Unlimited Squan-A-Tissit Chapter.

Approximately 150 people attended the October 1, 2002 public hearing held in Groton. Oral testimony included 52 comments supporting ACEC designation, and 13 comments opposing ACEC designation. Additional written comments were submitted.

- Additional Factors Supporting Designation

An important amount of the ACEC – approximately 2,640 acres, or 10% - is currently owned by state and local governments for conservation and recreation purposes, which is also a supporting factor for designation. Given the current amount of protected open space, wetlands and surface waters, open farmland and forest lands under Chapter 61 programs, and other undeveloped private lands, there is an

opportunity to sustain the ecological viability, natural characteristics and unique qualities of this ACEC. I find this a goal of immense value to the area and to future generations of these towns and of the region.

I strongly encourage the formation of a Petapawag ACEC stewardship group, in conjunction with the formation of a stewardship group for the Squannassit ACEC. The Petapawag ACEC includes five towns, and the Squannassit ACEC includes three of these towns (Ayer, Groton and Pepperell) plus six more (Ashby, Harvard, Lancaster, Lunenburg, Shirley and Townsend). Both ACECs share the Nashua River corridor and its associated resources. There a strong need for regional coordination and cooperation to meet the stated goals of the nomination and of the ACEC Program. The nomination document describes important stewardship goals and objectives for the area. These goals and objectives underscore the importance of coordination between the communities, and between all levels of government, community and environmental organizations, and residents. The ACEC designation can provide a framework and encourage this coordination and positive stewardship, and ACEC Program staff can provide technical assistance to an ACEC stewardship committee.

In addition, the Petapawag ACEC can provide a regional planning framework for environmental resource and open space preservation and management to take advantage of the goals, technical assistance and outreach of the Executive Office of Environmental Affairs' Watershed Initiative, Community Preservation Initiative, Biodiversity Initiative and other programs and assistance offered by environmental and other state agencies.

In summary, I find that virtually all of the criteria listed in the ACEC regulations support designation of the Petapawag ACEC. The quality and uniqueness of the resources of the area, high- and medium-yield aquifers, and outstanding biodiversity resources, in addition to other factors described above, are clearly sufficient for ACEC designation.

Conclusion

Therefore, for the reasons described in this document, I hereby exercise the authority granted to me pursuant to Mass. Gen. L. ch. 21A, § 2(7), to designate the Petapawag Area of Critical Environmental Concern. The significance of this ACEC requires that the highest standards of environmental review and protection be applied to actions that may affect its resources.

(Signed) Bob Durand December 11, 2002
Secretary of Environmental Affairs

[Original ACEC boundary description clarified to incorporate more accurate text, and entire document reformatted for ACEC Program website and public distribution, November, 2003.]